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United States General Accounting Office

GAO

Report to the Commander, U.S. Army Materiel Command

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CONTRACT PRICING

Material Prices Overstated on Tank Thermal Sights

GAO/NSIAD-88-54

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General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

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February 5, 1988

General Louis C. Wagner, Jr.
Commander, U.S. Army Materiel Command
Alexandria, Virginia 22333-0001

Dear General Wagner:

We have completed our pricing review of the $404,943,970 multiyear contract, DAAA09-79-G-2001-0045, awarded to Texas Instruments Incorporated, Defense Systems and Electronics Group, Dallas, Texas, by the U.S. Army Armament, Munitions and Chemical Command, Rock Island, Illinois. This contract is for the 5-year production of 4,125 AN/VSG-2 tank thermal sights.[1]

Our objective was to determine if Texas Instruments had complied with the Truth in Negotiations Act (Public Law 87-653) by providing accurate, complete, and current cost or pricing data and whether the contracting officer used the data to negotiate fair and reasonable prices. We found that Texas Instruments' cost and pricing data were generally in compliance with the act, but the data were not always correctly used by the Army negotiators. Consequently, the contract price was overstated by about $6.1 million. The Army negotiators overpriced the contract because they

- did not correctly use specific purchase order and vendor option data submitted with the Texas Instruments proposals, and
- decided not to use a final material update[2] submitted by Texas Instruments late in negotiations.

In addition, the Army negotiators did not require Texas Instruments to maintain and provide verifiable cost and pricing data to substantiate the company's proposed overage and scrap rates. Consequently, even though the Army negotiators believed the company's estimate was excessive, they did not have a factual basis to support their belief.

[1]A sight used to acquire targets and aim the main gun on the M-60A3 tank.

[2]A computerized report entitled Quote History Report by Part Number, dated February 18, 1984, which showed vendors, quantities, dates, and prices paid on purchase orders and vendor quotes and option agreements for system parts.

Army's Negotiators Did Not Use Current Cost and Pricing Data

The Texas Instruments bill of materials, which contained data on 109 parts comprising about 80 percent of material costs, was used by the Army negotiators to price direct materials. When Texas Instruments updated the supporting data on February 18, 1984, 6 days before agreement on contract price, the Army negotiators decided not to use that updated information because they believed additional negotiations would delay price agreement and might result in higher overhead rates being applied to the contract. Based on rough calculations, they estimated that the higher overhead rates expected would offset any savings from lower parts prices.

The material update information was significant and should have been used to negotiate lower prices for the affected parts, particularly the parts Texas Instruments proposed to acquire during the first 2 contract years for use throughout the 5-year production period.

We found that prices negotiated by the Army for 23 of the 109 parts on the bill of materials were higher than the supporting cost or pricing data and overstated total contract direct material cost by about $3.4 million.[3] Overstating direct materials by $3.4 million had the ultimate effect of overpricing the contract by about $6.1 million, including add-ons such as materials overage and scrap, material overhead costs, other direct costs, general and administrative expense, and profit.

The details on the submission of material cost and pricing data, and our analysis of how material costs were overstated are discussed in appendix I.

Reasonableness of Texas Instruments' Overage and Scrap Estimates Not Established

The Armament Command negotiators did not require Texas Instruments to maintain verifiable records to substantiate its overage and scrap estimates even though they believed they were excessive. In the absence of verifiable cost and pricing data on overage and scrap rates, the Army's negotiators developed their own estimate that could not be sustained during negotiations because it was also unsubstantiated. Essentially, the negotiators split the difference between the contractor's proposal and the Army's estimate. The Army's negotiation memorandum did not reconcile the negotiated amount with the Army negotiation objective to explain or justify accepting overage and scrap cost considered excessive

[3]Total materials for this contract were priced based on the top 80.1 percent of the bill of materials. Price changes in the top 80.1 percent were projected to the total or 100- percent bill of materials.

by the "should-cost" team that provided information on what the contractor's production costs ought to be.

The Army negotiators believed, based on the engineering estimates of the should-cost teams in 1979 and 1983, that an appropriate agreement was reached on overage and scrap rates. However, contractor's proposed rates often exceeded the should-cost team estimates by 50 percent or more. Army negotiators agree that Texas Instruments does not keep adequate overage and scrap rate records and that the company should maintain such data.

The Department of Defense policy[1] for pricing negotiated contracts is to avoid paying for contractor inefficiencies and uneconomical practices, such as the generation of excessive overage or scrap, when using historical cost data to price future contracts. Consequently, although overage and scrap estimates are often difficult to develop and support, substantive estimates should be required when significant amounts are involved. We estimate the total overage and scrap cost included in all tank thermal sight contracts was about $38 to $40 million. The overage and scrap issue is discussed in more detail in appendix I.

Conclusions and Recommendations

Texas Instruments complied with Public Law 87-653 by providing cost or pricing data, although late in negotiations. The Army, however, in its haste to award the contract did not use the data. Consequently, about $6.1 million of overpricing is not recoverable from Texas Instruments under the provisions of Public Law 87-653. Effectively using the cost or pricing data provided for the purpose of negotiating fair and reasonable contract prices is especially critical on multiyear contracts because much of the expected savings from this type of contract will be lost if future year prices are based on inaccurate, incomplete, and outdated data for the initial years prices. Therefore, we recommend that you direct your buying commands to order their negotiators to make maximum use of the cost or pricing data provided, and when data are provided late in negotiations, either delay contract award or insist on contingency provisions that conditionally approve the price subject to analysis of the latest data submission.

While voluminous amounts of information on estimated overage and scrap has been collected and analyzed by both the government and the

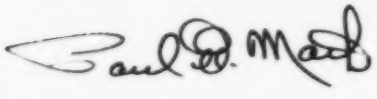
[1]The Defense Acquisition Regulation 3-807.2(b)(4), that was in effect when this contract was executed and is still in effect.

contractor, Texas Instruments did not maintain verifiable records of its historical costs from prior contracts. Such data would be valuable in estimating more realistic rates for pricing future contracts. Accordingly, we recommend that you direct senior Army officials to meet with the corporate executives at Texas Instruments and establish procedures whereby Texas Instruments will substantiate its estimated overage and scrap rates with verifiable historical cost data in negotiating significant future contracts.

We would appreciate being advised of any actions taken on this matter. If you or your staff need additional information, please call Mr. Joe D. Quicksall at (214) 767-2020.

We are sending copies of this report to the Commander, U. S. Army Armament, Munitions and Chemical Command, Rock Island, Illinois; Commander, Defense Contract Administration Services Region, Dallas, Texas; the Atlanta Regional Director, Defense Contract Audit Agency; the Secretary of the Army; and the Department of Defense, Office of the Inspector General, Washington, D.C. Copies will also be available to others upon request.

Sincerely yours,



Paul F. Math
Senior Associate Director

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Abbreviations

DCAA	Defense Contract Audit Agency
DCAS	Defense Contract Administration Services
FPRA	forward pricing rate agreement

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AN/VSG-2 Tank Thermal Sight Multiyear Contract Overpriced by the U.S. Army Armament,Munitions and Chemical Command

Background

Public Law 87-653 requires that, with certain exceptions, contractors submit cost or pricing data in support of proposed prices for noncompetitive contracts. Prime contractors and subcontractors are also required to certify that the data submitted are accurate, complete, and current. In cases where Public Law 87-653 is applicable, a clause is included in the prime contract giving the government a contractual right to a price reduction if the price was increased because the data submitted were not in accordance with the statute and the certification. However, if the contractor submits accurate, complete, and current cost and pricing data, but the government does not use it effectively to negotiate the contract, the government has no contractual basis for recovering any overpricing that may occur.

Since the late 1970s, Texas Instruments Incorporated, which developed the AN/VSG-2 tank thermal sights used to aim the main gun on the M60A3 tank, has been the sole-source provider for the gun sight with a proven production rate of 80 a month. The Army had ordered 3,708 sights from the contractor before it awarded this multiyear contract.

In November 1982, to avoid a break in production, the Armament Command, while seeking final approval for a multiyear contract, authorized Texas Instruments to continue production under an annual contract arrangement with a fixed-price multiyear option. On March 4, 1983, the multiyear option was exercised with a ceiling price of $482.6 million. The contract price was to be negotiated later. In total, 4,125 tank thermal sights were ordered under this contract.

Texas Instruments submitted a multiyear cost proposal on March 21, 1983, updating it in August, October, and November 1983 and in January 1984. The Defense Contract Audit Agency (DCAA) audited the proposal as well as the August 1983 update of the proposal, and provided its reports, along with an earlier report that described deficiencies in the contractor's cost-estimating system that could affect the pricing of follow-on fixed-price contracts, to the contracting officer before negotiations.

Contract negotiations began in December 1983 and were completed on February 24, 1984, with a fixed-price contract agreement of

$404,943,970, about $39 million more than the negotiation objective established by the Army's should-cost[1] team.

Texas Instruments Submission of Cost and Pricing Data

To support its proposals for direct material, the contractor submitted computerized reports entitled, IM5050 Bill of Materials Estimate-Purchased Parts. These bills of materials compiled the requirements for each part in the system and the total needed to produce the 4,125 sights. They also listed quantities, including scrap and overage quantities, and proposed unit costs for parts that comprised about the top 80 percent of the total extended cost of gross materials, and projected these costs to estimate the total direct materials cost for the systems. During material negotiations, any change to those costs making up the top 80 percent are projected to the total direct materials cost.

Table I.1 shows the October 1983 and January 1984 proposals the direct material estimates for the 5-year contract.

Table I.1: Contractor's Total Materials Estimate by Contract Year (Includes Both Gross Materials and Subcontracts)

Year	System quantity	October 1983	January 1984
1	640	$12,631,526	$12,518,101
2	640	19,518,063	19,336,282
3	960	20,426,927	20,215,125
4	960	21,356,572	21,109,610
5	605	14,043,761	13,880,185
Total	**4,125**	**$87,976,849**	**$87,059,303**
Material overage and scrap		$11,254,626	$11,176,635
Labor for scrap		$1,946,701	$1,937,687

Texas Instruments' proposals for overage and scrap, according to the Army's negotiation memorandum, were supported by engineering estimates based on data from the production of 1,581 sights in 1979 and 1980. The contractors' latest proposal, January 1984, showed material overage and scrap of $11.2 million, or 16.1 percent of gross materials. The labor scrap estimate, this is, labor attributable to scrapping certain parts during higher levels of assembly, was supported by gross labor

[1]Should-cost is defined in the Armed Services Pricing Manual as a specialized form of cost analysis that identifies uneconomical and inefficient practices in a contractor's management and operations, and quantifies the cost impact for realistic contract pricing objectives.

estimates that summarized labor costs and included engineering estimates for labor scrap. The January 1984 proposal showed a labor scrap cost of $1.9 million, according to the Army's negotiation memorandum.

During negotiations, the Army's negotiators set a cutoff date of January 27, 1984, for negotiating the bill of materials so that other costs directly related to the total bill of materials amount could be processed. Subsequently, a material update listing dated February 18, 1984, was provided by the company for review. The negotiators reviewed this update and noted that some prices were increasing and some decreasing. The most notable prices decreasing, according to the Army's negotiation memorandum, were the germanium blanks. The negotiators decided not to reopen negotiations on the bill of materials because, according to them, pending overhead rate increases appeared to more than offset any price changes on materials

How Direct Material Cost Was Overstated

The direct material cost for the multiyear contract may have been overstated by about $3.4 million because the Army's negotiators did not use the latest cost or pricing data. When other indirect costs and profit are applied to the $3.4 million, the amount of estimated overpricing increases to $6.1 million. We classified the reasons for excessive material costs into three categories. Table I.2 shows our classification of reasons, the number of parts overpriced, and amount of overpricing we attribute to those parts and the total estimated overpricing of $3.4 million.

Table I.2: Overpricing Classified by Reason

Reasons	Number of parts	Amount of overpricing
Negotiated cost differs from supporting cost/ pricing data	13	$948,771
Did not use lower price in February 1984 update	5	1,076,464
Did not use lower price quotes available prior to price agreement	5	660,163
Total (80 percent of bill of materials)	23	$2,685,398
Total (100 percent of bill of materials)		**$3,352,556**

Table I.3 is our computation of the amount of overpricing attributable to these 23 parts and the projected overpricing to the total bill of materials.

Table I.3: Our Computation of the Amount of Parts Overpricing

Part name	Amount of overpricing
Thirteen parts priced higher than supporting data	
Raw germanium	$167,150
Power supply	334,156
Poly laminant	7,814
Prism blank	8,080
Raw casting	5,339
I square tube	251,563
Cable assembly	109,647
Relay	11,065
Motor	11,626
Motor	13,394
Connector	5,052
Sapphire substrate	18,128
Getter	5,757
Total	**$948,771**
Five parts priced higher than material update data	
Germanium blank-0125	$854,375
Germanium blank-0126	89,260
Cast Balsh	85,969
Cast Cover	19,238
Capacitor	27,622
Total	**$1,076,464**
Five parts priced higher than available quotes	
Germanium blank-0127	$24,517
Germanium blank-0128	33,454
Germanium blank-0146	424,094
Germanium blank-0129	112,312
Germanium blank-0130	65,786
Total	**$660,163**
Total overpricing on 80.1 percent bill of materials	**$2,685,398**
Overpricing projected to the total bill of materials ($2,684,398/ 0.801)	**$3,352,556**

Cost and Pricing Data Did Not Support Negotiated Price

We found the Army's negotiators did not use the correct data on unit prices or quantities purchased for the first 13 parts on table I.3 where costs differed from the supporting data. Instead, they generally priced the parts by multiplying the quantity required for each production year

by the unit prices shown in the contractor's periodic Quote History Reports. The unit price was usually the most recent or a composite of unit prices paid by the contractor escalated for the remaining years of the multiyear contract.

This general pricing methodology did not always recognize that the contractor had proposed to buy some parts in larger quantities early and had negotiated fixed option prices for some parts. The following example illustrates how not using the correct data overpriced some parts.

Power Supply, Part Number-0802357-0002

The material cost for this part was estimated incorrectly by the Army negotiators because they did not consider (1) the unit price in an option agreement and (2) the actual quantity purchased.

Two vendors supplied this part to Texas Instruments, which negotiated an option agreement with one vendor to provide 70 percent of the parts needed at a unit price of $212 throughout the 5-year period. The contractor submitted the option data with its proposal, but the Army's negotiators did not use the data.

Each sight requires two power supplies; thus, 8,250 power supplies were required to produce the 4,125 sights for the 5-year production contract. In March 1983 the contractor purchased 1,670 power supplies at the option price under the option agreement. In the first week of February 1984 the contractor purchased an additional 5,366 power supplies from this vendor at the option price.

The Army negotiated a unit price of $239.15 (an average unit price based on prior purchases from two vendors) for the first year and escalated that price for the next 4 years at different annual escalation rates. The part's cost was overstated because the option price was fixed for the term of the contract, and there was no reason to escalate the unit price for 70 percent (5,775) of the required power supplies. Table I.3 shows our calculation of the estimated cost for the total quantity (8,250) needed of this part using the actual option price and allocating units already purchased to each year's gun sight production. Our calculations show that the estimated cost should have been about $334,000 less than negotiated.

Table I.4: Calculation of the Estimated Cost of Power Supply (Part Number-0802357-002)

	Contract Period					
	1	2	3	4	5	Total
Negotiated price	$239.15	$253.34	$263.83	$275.38	$288.07	
Our computed price	213.91	248.28	212.00	212.00	229.45	
Difference	$25.24	$5.06	$51.83	$63.38	$58.62	
Quantity required	1,280	1,920	1,920	1,920	1,920	**8,250**
Difference multiplied quantity by required	$32,307.20	$9,715.20	$99,513.30	$121,689.60	$70,930.20	**$334,155.80**

February Update Not Used to Price Parts

The second group of five parts shown on table I.3 were overpriced because the Army negotiators decided not to use the contractor's updated parts' price report that was dated 6 days prior to price agreement. Using these updated unit prices would have reduced parts cost because large unit price reductions were being obtained on some parts. The updated information was also important because it showed two of the seven germanium blanks in the system were being purchased at prices lower than expected. Since the blanks are usually quoted together, the Army negotiators recognized that the unit prices of all germanium blanks might be lower, but did not pursue the matter.

The updated prices also showed that some unit prices were decreasing, not increasing as the Army's negotiators expected. We believe this information should have prompted a reevaluation of the escalation included in the multiyear contract. However, according to the Army's price negotiation memorandum, the negotiators believed the update showed unit prices going both up and down. Our analysis of the update did not support their observation. Our analysis of the February 1984 Quote History Report showed that most parts had either no price change or a price reduction and that only one part showed a price increase.

The following example illustrates how not using the updated price information overpriced some parts.

Capacitor, Part Number-0538135-0230

This part is common to several different systems the contractor produced and is purchased in quantities for all applications. The supporting data showed that 1,046,000 capacitors were purchased in 1983, the first year of the contract, for an average price of 14.5 cents each. The Army

negotiated a unit price of 14.7 cents for the first contract year and escalated that price for the next 4 years at the rate of about 4 percent annually. This translated to negotiated unit prices of 15.4 cents for the second year, 16 cents for the third year, 16.6 cents for the fourth year, and 17.3 cents for the fifth year.

The January and February 1984 material updates showed the contractor had purchased 250,000 capacitors at an average price of 12.3 cents each instead of the escalated unit price of 15.4 cents that had been negotiated for the second contract year. The update showed the unit price was going down, not up, in the second contract year. Using the updated unit price of 12.3 cents for calculating the second and subsequent production years would have reduced the estimated cost of this item by about $27,622, as shown in table I.5.

Table I.5: Calculation of the Estimated Cost of Capacitor (Part Number 0538135-0230)

	Contract Period					
	1	2	3	4	5	Total
Negotiated price	$0.147	$0.154	$0.160	$0.166	$0.173	
Our computed price	0.145	0.123	0.128	0.133	0.138	
Difference	$0.002	$0.031	$0.032	$0.033	$0.135	
Quantity required	154,240	231,360	231,360	231,360	145,805	
Difference multiplied quantity by required	$308.48	$7,172.16	$7,403.52	$7,634.88	$5,103.17	**$27,622.22**

Our calculations are conservative in that they include the Army's assumption of 4 percent increases in prices in the third through fifth contract years.

Available Lower Price Quotes Not Used to Price Germanium Blanks

Unit price reductions for two germanium blanks were shown in the February update. These updated prices signaled possible reductions in the other five germanium blanks that the Army's negotiators should have pursued. Unit price reductions on germanium blanks were particularly important because seven germanium blanks are used in the gun sight and the March proposal showed early receipt of all blanks was planned to avoid price escalation in later years. The Army's negotiators recognized that the unit prices of germanium blanks might be lower, but did not pursue the matter. We believe the Army's negotiators should have considered vendor price reductions on germanium blanks.

Germanium Blank, Part Number 0801530-0146

In 1983 the contractor purchased 1,117 units, which are used only on the gun sight, at $781.36 each. The Army negotiated a unit price of $781.36 for the first contract year and escalated that price at 6 percent annually for each of the next 4 contract years. This translated into negotiated unit prices of $828.24 for the second contract year, $877.94 for the third year, $930.61 for the fourth year, and $986.45 for the fifth year.

The Army's pricing methodology, however, did not consider that 477 of the 1,117 units already purchased would be available for use during the second year of production at the purchased unit price. Three days before the Army reached a price agreement on the prime contract, Texas Instruments ordered germanium blanks for subsequent contract years at reduced prices. The reduced prices were reflected by the February 1984 update that showed two of the seven germanium blanks used in the gun sight had been purchased in January 1984 at prices less than the contractor's proposed unit prices. The Army's price analyst told us that the reduction in unit prices led the negotiators to conclude that unit prices for the other germanium blanks also would be reduced because the same vendor was quoted on all blanks. The Army's negotiators, however, did not review the contractor's vendor purchase files for additional data and did not reduce the germanium blank prices.

Since the contractor proposed to receive all germanium and germanium blanks during the first 2 years of the contract, we believe these lower prices represented significant potential multiyear contract savings and should have been considered by the Army's negotiators.

Data in the purchase file showed that as of February 13, 1984, the vendor had quoted $749.50 for this blank and that the contractor had negotiated a unit price of $745.75, not $828.24 as negotiated by the Army for the second contract year. The contractor issued a purchase order for 1,680 units at $745.75 each on February 21, 1984. Again, the quote and purchase order data showed the unit price in the second contract year was decreasing, not increasing. Use of the lower price quote available in the purchase file and allocation of the 2,797 units (1,117 + 1,680) to be purchased in future years would have reduced the estimated price of this part by about $424,094, as shown in table I.6.

Table I.6: Calculation of the Estimated Cost Germanium Blank (Part Number-0801530-0146)

	Contract Period					
	1	2	3	4	5	Total
Negotiated price	$781.36	$828.24	$877.94	$930.61	$986.45	
Our computed price	781.36	763.44	745.75	779.44	837.92	
Difference	$0.00	$65.80	$132.19	$151.17	$148.53	
Quantity required	640	960	960	960	605	
Difference multiplied quantity by required	$0.00	$62,208.00	$126,902.40	$145,123.20	$89,860.65	**$424,094.25**

Our calculations are conservative because they include the Army's assumption of 6 percent inflation on additional blanks needed for the remaining fourth and fifth years of production.

Overpricing Occurred Because Army Negotiators Did Not Use Latest Cost and Pricing Data

The Army's negotiators decided not to use Texas Instruments' February 18, 1984, materials update because they believed it would require renegotiation of material costs, which would delay negotiations and result in new overhead rates being used on the contract. They believed the increased cost from the new overhead rates (estimated at $800,000 by the Army and over $1 million by the contractor) would offset any price decreases calculated using the material update. Also, the negotiators told us they were concerned that a congressionally mandated product warranty provision would have to be negotiated if the contract were not definitized by March 15, 1984. The contractor did not estimate the cost of this warranty provision, but the Army told us it believed such a provision would have cost about $4 million. We must presume, however, that if the contract was definitized after March 15, 1984, the Army would have received an added value of $4 million in warranty provisions. Therefore, this should not be considered an offset to the overpricing of about $6.1 million because the Army negotiators did not consider more current cost and pricing data.

The contractor's proposed overhead rates for material, manufacturing, engineering, and general and administrative expenses were based on a forward pricing rate agreement (FPRA) in effect when the multiyear contract was being negotiated. The Army's negotiators accepted the proposed rates as the negotiated rates for 1984 through 1986 and agreed on projected rates for 1987 and 1988. The Army's price negotiation memorandum noted negotiations for a new FPRA would not be completed before April 1984 and thus, it would have no effect if contract pricing were completed before April 1984.

According to a member of the Army's negotiation team, the administrative contracting officer at the contractor's plant who monitored the FPRA told the team that although the amount of increase was unknown, the new rates would be higher than those in the existing FPRA. Based on this information, a price analyst compared the contract price using both the old and the newly proposed rates. The analyst's comparison showed the contract price could increase by about $800,000 if the proposed rates were used in the contract. The contractor, according to the Army's negotiation memorandum, estimated that overhead would increase by over $1 million.

The new FPRA proposal became effective April 10, 1984, about 45 days after contract price agreement. Had the negotiations continued an additional 45 days, the new rates would have increased the contract price by about $344,000.

The lower than expected effect on costs of the new rate agreement occurred primarily because the contractor's proposed rates were reduced during negotiations. The Army's price analyst used the contractor's proposed rates in the calculation and made no allowance for reductions that normally occur during negotiations.

Reasonableness of Overage and Scrap Not Established

Since the first tank thermal sight production contract was awarded in 1977, Texas Instruments has not supported its overage and scrap estimates with verifiable cost or pricing data. DCAA's audit report on the March 1983 multiyear proposal highlighted this continuing problem in a section on reported contractor estimating system deficiencies. DCAA reported that the contractor, in most cases, judgmentally increased materials for overage and scrap and that these increases could duplicate material costs proposed elsewhere. The contractor, according to the report, had not produced auditable evidence to support its position that duplication did not occur. Also, DCAA reported that verifiable cost or pricing data on labor overage and scrap was not available.

As in the previous contracts, the contractor's multiyear cost estimates proposed for overage and scrap were based on engineering estimates that were not substantiated by verifiable cost or pricing data. In its January 1984 proposal, the contractor proposed about $11,176,635 for material overage and scrap and $1,937,687 for labor overage and scrap. The Army negotiated $8,940,174 for material overage and scrap and $1,000,672 for labor overage and scrap. These cost elements were negotiated without cost or pricing data because The Armament Command

had not insisted that Texas Instruments substantiate these cost elements with verifiable records, even though the Command had data showing that the proposed amounts were excessive and unreasonable.

Prior Contractor Price Proposals Showed Upward Trend in Overage and Scrap

Although Texas Instruments had been producing gun sights since 1978, its proposed amounts for overage and scrap on follow-on production contracts tended to increase rather than decrease as is normally expected when production experience is gained. A Defense Contract Administration Services (DCAS) technical specialist who evaluated proposals for the prior contract concluded that the amount of scrap for castings and germanium blanks should be less than proposed by the contractor and should decrease with the increased production experience.

Table I.7 shows material overage and scrap rates proposed by the contractor on prior contracts and the rates recommended by DCAS personnel. Contract numbers and production counts were taken from the applicable Army should-cost study.

Table I.7: Proposed and Recommended Material Overage and Scrap Rates by Contract

Contracts	Award date	Purchase quantity	Overage and scrap rate	
			Proposed	Recommended
DAAEO7-76-C-3241		•	•	•
MOD P00017-C-3241	Nov. 1977	300	Not Available	
Modification	Sept. 1978	330	8.43	N/A
Total		**630**		
DAAK20-79-C-0023	July 1979	1,000	11.44	7.4
MOD P0008-C-0023	Sept. 1980	415	16.53	6.73
MOD P00011-C-0023	Jan. 1981	166	17.15	6.79
MOD P00020-C-0023	Sept. 1981	878[a]	12.14	3.1
Total		**2,459**		

[a]An add-on quantity of 734 systems was proposed for MOD P00020-C-0023, and an additional 144 systems were added during negotiations for a total add-on of 878 systems.

The Army purchased an additional 619 (for a total of 3,078) sights on contract DAAK20-79-C-0023, based on the prices negotiated for the add-on quantity of 878 sights. By the end of December 1983, the contractor had delivered about 3,000 sights.

The overage and scrap rates recommended by DCAS' cost and price analysts on the prior contract were based on a technical analysis of parts in the top 80 percent of the contract bill of materials. Much of the analysis

was done by a should-cost team and it appeared to be relatively thorough.

First Should-Cost Analysis

The should-cost analysts developed their recommendation for overage and scrap for a 1,000-sight order by grouping items on the bill of materials into four parts categories: castings and machined parts, optics parts, assembly parts, and all other parts. Each category was then analyzed based on the following considerations:

- Historical scrap rates on prior contract, determined by examination of drawings and job unit cost reports.
- The likelihood of losing or damaging parts during assembly, testing, or burn-in.
- Parts normally returned to vendor for replacement under warranty clauses.
- Review of drawings, test procedures, and other data to estimate scrap rates for various parts and material.

The analysts recommended rates for each of the four categories and a composite material scrap rate of 7.4 percent. The recommended rates by category were: castings-9 percent, optics-17.6 percent, assembly parts-4.3 percent, and all others-4.3 percent. The contractor's proposed rates for three of the parts ranged as follows:

- casting—from 12 to 30 percent,
- optics—from 20 to 30 percent, and
- assembled parts—from 2 to 12 percent.

A DCAS production engineer at the contractor's plant also performed technical analyses of the contractor's proposals for the 415, 166, and 734 systems ordered under contract 0023. Each analysis included all parts in the top 80 percent of the contract bill of materials.

Parts in the bill of materials were grouped into various categories, each category was analyzed, and an overage and scrap rate was developed for each part number in the top 80 percent by extended cost. In making the analyses and developing the rates, the production analyst considered (1) the recommendations of the should-cost team, (2) the number of systems delivered to that point, (3) the nature of the parts (whether easily broken), (4) how the parts were used in manufacturing, (5) vendor warranties, and (6) personal experience with various aspects of gunsight production.

The analyst used the rates to develop overage and scrap costs for each part and each category and summarized the categories to develop total recommended overage and scrap rates for the top 80 percent of the materials. This analyst recommended a material overage and scrap rate of 6.7 percent for the 415 option-purchases (MOD P00008-C-0023).

In reviewing overage and scrap proposals on the prior contracts, the should-cost team and the Army Material Command business clearance review group noted that

- the contractor's proposed scrap amount was unreasonable and that actual scrap under contract DAAK20-79-C-0023 should be far less than the current experience,
- the should-cost team had not provided a satisfactory explanation of the contractor's system of accumulating cost by department/contract relative to proposed overage and scrap cost, and
- the contractor had not provided adequate support or justification for its overage and scrap proposals.

Should-Cost Analyses of the Multiyear Contract

With this experience on the prior contract, the should-cost team for the multiyear contract also found that (1) the contractor's support for proposed overage and scrap was unacceptable and (2) overage and scrap was not being controlled. After analyzing the bill of materials, the team recommended a rate of about 6.9 percent, less than 1/2 the 16.1 percent in the contractor's January 1984 proposal.

The contractor's support for overage and scrap, according to the should-cost evaluation, was a report based on data developed for 1,581 systems produced from May 1980 to February 1983. The should-cost team concluded that the contractor's support was not a sound basis for projecting scrap for the remaining 4-1/4 years of the multiyear contract and cited the following major faults with the data.

- The data averaged early production results that had very high scrap rates not representative of current or projected production.
- The data showed no trends, only a required quantity and a scrapped quantity. It gave no indication as to when the scrap occurred, and did not show whether the contractor was becoming more or less efficient.
- The data included only 60 of the 109 parts in the top 80 percent of the materials list. For the other parts, only judgment was used to develop the scrap rates.

In addition, the should-cost team made the following comments concerning accountability and control of overage and scrap.

- Briefings by contractor personnel and review of the quality data system did not support the high scrap rate proposed by the contractor.
- Generally, records of scrap amounts were not maintained to support the rejections through repair or ultimate scrapping so that appropriate rates could be established.
- From briefings, discussions with the contractor, and reviews of data provided by the contractor, the team concluded that actual scrap rates were considerably lower than those projected in the proposal.
- The team determined that the contractor had neither an effective scrap data collection system nor a formalized ongoing effort in effect to control or reduce scrap.
- The team concluded that it was unreasonable for the government to finance such excessively high levels of scrap.

The should-cost team developed overage and scrap rates for establishing negotiation objectives using two methods of analysis. In one method, the team used data submitted in support of the contractor's proposal, as well as data gathered from other sources. The data submitted by the contractor showed the quantity of scrap for 55 parts in the top 80 percent of the bill of materials, but this data could not be used by itself to calculate rates because it did not show the number of parts received during the period or the number of good parts produced. In addition, the should-cost team used the amounts of scrap reflected in the data for the 55 items. The team used the scrap data and the remaining multiyear production period to determine the rate. In the second method, the team used the 1-year period covered by the report. In both analyses, overage and scrap for seven parts with proposed rates exceeding 100 percent were calculated separately and then combined with the others to calculate an overall composite rate. The team's report stated that by using both methods of analysis, it developed basically the same scrap percentage (6.8% and 6.96%), thereby increasing confidence in that figure.

To compensate for possible shortcomings in its analysis approach, the team increased its scrap estimates for two unknown factors in developing negotiation objectives. First, it increased the projected scrap quantities to allow for inaccuracies in a reasonable data collection system. Secondly, it increased the scrap rates based on the contractor's contention that a large number of scrapped parts were not captured on the data submitted. This increase was based on a review of available data and engineering estimates.

The team then selected the highest rates for its recommended negotiation position—6.96 percent for the minimum, 10.15 percent for target, and 13.35 percent for maximum.

Multiyear Contract Negotiations

From January 9 to February 24, 1984, the Army and the contractor considered several alternative methods and rates in negotiating overage and scrap. Each party demonstrated some flexibility in their initial position, but the Army's negotiators conceded about one-half of the difference between the amounts proposed by the contractor and the Army.

On a dollar basis, the contractor proposed $11,176,635 and the Army offered $6,457,290. According to the Army's negotiation memorandum, the negotiated amount was about $8,940,174. The difference between the two estimates—$4,719,345—was essentially split by the negotiators.

DCAA had reported since 1981 that Texas Instruments was not maintaining adequate cost accounting records of scrap. The should-cost team had concluded that the contractor's proposed scrap rate was unreasonable. Thus, the Army attempted to estimate a reasonable scrap rate rather than require the contractor to substantiate its proposal. While the Army may need to accept engineering estimates of scrap on initial production runs, estimates are rarely used through 5 years of production and then negotiated for a multiyear contract for 5 additional years, especially when the amounts are as substantial as those in this contract.

Labor Scrap Also Questionable

The Army also negotiated labor scrap cost of about $1,000,672 (a rate of 3.1 percent) for the multiyear contract even though the contractor did not provide verifiable cost or pricing data for this cost element. The rate of 3.1 percent was the same rate negotiated in the prior contract, which the Army believed was questionable.

The labor scrap rates proposed and negotiated for orders under the prior contract (DAAK20-79-C-0023) also were not supported by verifiable cost or pricing data and were questioned by both Army personnel and defense contract auditors. Under this contract, the Army purchased 1,000, 581, and 734 gun sights. On the first order for 1,000 gun sights, according to the should-cost evaluation, the contractor did not include a separate estimate for scrap labor in its proposal, but did include material overage and scrap. Proposals for the 581 and 734 units included labor scrap as a separate cost estimate.

The contractor proposed a rate of 8 percent for labor scrap on the order for 581 systems, which was negotiated during April 1981. The Army's pricing negotiation memorandum stated that the proposed rate was excessive, and that, while some loses might be incurred, a 2- or 3-percent labor scrap rate was more realistic. After extensive data review and discussion, the contractor finally accepted a rate of 3.1 percent, which the contractor considered inadequate.

In support of its position, the Army noted that it had approved (1) engineering changes to reduce scrap labor, such as allowing the contractor to use certain glass with minor chips, blemishes, or flaws and (2) a test of all castings to reduce losses when castings were being machined. Also, an Army technical analyst evaluated the contractor's labor scrap data and previous should-cost records, and concluded that 3.1 percent was the maximum that could be justified and that 1 to 2 percent was more reasonable, since some of the scrap losses might duplicate costs included in other cost estimates.

DCAA also raised the concern that proposed scrap cost could duplicate costs in other cost categories, based on its review of the contractor's estimating system. DCAA reported that according to the contractor, overage and scrap may occur from any of the following causes: (1) operator error, (2) quality control rejection of the piece part or assembly, (3) parts lost (destroyed) during burn-in and parts conditioning, (4) change in design, (5) damage or destruction in material handling, (6) pilfering, (7) parts lost during fabrication and assembly, and (8) parts lost (destroyed) during system acceptance testing and burn-in. DCAA stated that costs associated with the above causes are already included in the contractor's cost accounts and are proposed as part of a direct cost estimate. Consequently, to allow scrap in excess of that proposed for another estimate could result in duplicate costs. Further, the report stated that although DCAA had repeatedly requested the contractor to provide auditable evidence of overage and scrap, the contractor had not done so.

On the order for 734 systems, the contractor submitted a proposal about 2 months after the price was negotiated for the 581 systems order. The contractor proposed 4 percent for labor scrap instead of the 8 percent proposed earlier for the 581 systems order. A price for the 734 units was negotiated during September 1981.

In auditing this proposal, DCAA reported that the contractor's cost accounting system did not segregate such labor costs, nor were any

records made available to determine such losses on a statistical basis. As a result of this audit, the administrative contracting officer told the contractor on July 14, 1981, that its cost accounting practices used in estimating, accumulating, and reporting actual cost of contract performance did not comply with the Cost Accounting Standard requiring consistency. In the absence of cost accounting data, DCAA recommended the 3.1-percent rate negotiated for the 581 units.

For the 5-year contract, the contractor proposed a labor scrap rate of 6 percent, compared to the 8 and 4 percent proposed previously for the 581 and 734 units. The contractor's March 1983 proposal included about $1.8 million for labor scrap. The proposals, which again were not supported by verifiable cost and pricing data, were reviewed by DCAA and an Army should-cost team. DCAA questioned the entire proposed amount as unsupported. The should-cost team recommended the 3.1-percent rate negotiated for previous orders as the target and zero percent as the minimum negotiation objective because the contractor had produced no evidence that labor scrap existed.

The labor scrap cost element for the multiyear contract was, according to the Army's price negotiation memorandum, negotiated at the 3.1-percent rate. The principal support for this rate was that it had been accepted by both parties in previous negotiations. Had the Army insisted on adequate support for the scrap proposals, this cost element could have been resolved without uncertainty as to its reasonableness.

For follow-on production contracts, such as the tank thermal sight, the practice of negotiating scrap allowances that are not supported by cost and pricing data can result in significant overpricing of contracts. The Army negotiated about $38 million to $40 million in material and labor overage and scrap allowances and related overhead and profit for the tank gun sight without adequate evidence that such allowances were reasonable.

Objective, Scope, and Methodology

Our objective was to determine if the contractor had submitted accurate, complete, and current cost or pricing data as required by Public Law 87-653. We reviewed technical analyses of the contractor's proposals, DCAA audits of the contractor's proposals, a DCAA post-award review of the multiyear contract, the Army's should-cost team reports and price negotiation memorandum, and the cost and pricing data supporting the contractor's proposal. We also, interviewed DCAA auditors, personnel with the DCAS Plant Representative's Office at Texas Instruments, Armament

Command negotiators, and Texas Instruments personnel. We did not perform a reliability assessment of data obtained from the contractor.

We tested the pricing of the 109 parts on the bill of materials and found 23 of them had not been priced with the latest available data. Thus, we recomputed the estimated costs of these 23 parts using the unit prices and quantities purchased shown in the most accurate, complete, and current data available from the contractor. Recomputing these estimated costs required allocating the purchased parts to production because some parts had been bought in greater quantities than necessary for the scheduled annual production rates. Allocating parts to production was complicated because some parts, called common parts, had been used on systems other than the tank thermal sight.

For common parts used on other systems, we allocated purchased quantities to requirements identified by the company for all common systems, including the tank thermal sight. Quantities of common parts not required for common system production were allocated to the tank thermal sight production. In this way all purchased quantities were allocated either to other production or tank thermal sight production. For additional parts needed for the tank thermal sight production, we increased the last purchase prices at the escalation rates negotiated by the Army.

For parts used only on the tank thermal sight, called system unique parts, we allocated the total quantities purchased to production at the annual production rates planned over the 5-year period. Remaining quantities, if any, were priced at the last purchase price escalated to the time of purchase for production schedules at the escalation rates negotiated by the Army.

Since the Army had developed a separate estimate of overage and scrap instead of requiring the contractor to support its estimate, we reviewed technical reports and negotiation documents from previous tank thermal sight contracts that the Army used in developing its estimate. The Texas Instruments estimate for overage and scrap which were part of the bill of material estimate, were identified as engineering estimates and were not reconciled to company records.

We did our review at the Texas Instruments facilities in Dallas, Texas, and at the buying command, U.S. Army Armament, Munitions and Chemical Command, Rock Island, Illinois. We performed our review in

accordance with generally accepted government auditing standards from April 1986 through March 1987.

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